

TABLE 2.—Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m. (E. S. T.) during December 1935

[Wind from N = 360°, E = 90°, etc.]

Altitude (m) m. s. l.	Albu- querque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincin- nati, Ohio (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfrees- boro, Tenn. (180 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface.....	342	1.5	321	2.7	254	3.7	301	3.6	285	4.7	277	1.4	278	1.8	296	4.2	301	0.2	40	2.0	26	2.3	94	0.2	288	0.8
500.....	327	4.2	327	4.2	311	7.2	322	7.1	316	6.9	299	3.3	275	4.4	309	7.1	275	1.5	101	2.0	44	3.4	89	0.7	299	3.8
1,000.....	311	7.2	294	9.9	271	7.2	298	7.5	287	7.1	305	5.4	280	6.2	304	5.2	318	7.2	273	4.6	285	2.3	149	5.6	303	5.7
1,500.....	294	9.9	284	10.5	295	7.6	288	9.0	300	10.7	318	8.8	303	6.9	280	8.5	321	7.5	319	11.4	281	6.8	278	5.0	208	5.7
2,000.....	335	2.7	306	3.4	287	13.4	297	8.7	283	8.8	308	11.2	328	10.0	308	9.8	325	7.3	332	12.9	287	8.7	288	6.7	217	5.8
2,500.....	306	3.4	301	5.4	266	13.1	295	9.3	289	7.0	308	11.2	328	10.0	308	9.8	325	7.3	332	12.9	283	10.8	288	7.9	203	4.6
3,000.....	301	5.4	292	8.6	293	10.1	297	5.6	297	3.8	297	5.6	297	3.8	297	5.6	297	5.6	297	5.6	262	14.4	258	7.8	218	1.5
4,000.....	292	8.6	298	12.9	293	10.1	297	5.6	297	3.8	297	5.6	297	3.8	297	5.6	297	5.6	297	5.6	290	4.7	290	4.7	290	4.7
5,000.....	298	12.9	293	10.1	297	5.6	297	3.8	297	3.8	297	5.6	297	3.8	297	5.6	297	5.6	297	5.6	297	5.6	297	5.6	297	5.6
Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Har- bor, Terri- tory of Hawaii ¹ (68 m)		Pensacola, Fla. ¹ (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washing- ton, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface.....	304	2.4	116	0.8	59	0.2	288	0.7	54	2.3	23	3.9	277	1.8	138	2.4	71	1.4	68	1.5	161	2.3	254	0.3	294	2.9
500.....	307	7.7	76	1.0	300	1.6	297	2.1	86	3.9	8	3.1	284	4.7	300	5.3	296	7.1	38	1.0	58	1.3	184	7.3	305	8.7
1,000.....	307	7.8	181	0.9	318	5.1	294	5.2	89	4.4	300	5.3	296	7.1	312	1.6	326	2.9	326	2.9	202	7.6	128	2.4	313	10.6
1,500.....	308	8.9	229	2.0	307	7.2	300	6.7	94	2.8	294	8.4	297	8.1	158	2.8	352	2.1	317	2.4	208	8.0	178	3.7	309	11.3
2,000.....	296	9.7	243	2.0	312	9.7	305	8.5	103	2.1	291	11.3	290	9.3	181	2.6	321	1.6	210	7.4	219	3.3	292	12.7	297	12.7
2,500.....	307	10.8	242	2.6	301	11.7	308	7.9	115	2.6	288	13.8	296	9.6	249	2.0	322	2.0	208	6.0	248	5.4	281	11.2	281	11.2
3,000.....	252	3.3	307	11.8	307	10.6	273	2.2	281	15.5	306	12.1	287	2.8	312	3.2	212	7.2	261	6.0	226	8.0	226	8.0	226	8.0
4,000.....	235	3.4	284	14.2	272	22.0	272	22.0	272	22.0	290	6.6	293	5.5	290	4.2	290	4.2	290	4.2	290	4.2	290	4.2	290	4.2
5,000.....	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4	251	6.4

¹ Navy stations.

AEROLOGICAL OBSERVATIONS FOR THE YEAR 1935

[Aerological Division, D. M. LITTLE, in charge]

By L. T. SAMUELS

Only those stations having a record of 1 year or nearly 1 year are included in table 1. The length of period on which the normals are based at those stations for which departures are indicated is shown at the bottom of table 1.

Airplane weather observations were discontinued at Boston by the Massachusetts Institute of Technology during May, and resumed there by the War Department on August 1. On June 15, that Department began observations at Barksdale Field, Shreveport, La. Airplane weather observations were discontinued at Sunnyvale, Calif., during October when the Navy Department moved its flying activities from that field. Airplane observation stations were established at El Paso, Tex., and Spokane, Wash., on July 1, by the Weather Bureau under contract with a commercial operator; the Washing-

ton State National Guard had made these flights for the Weather Bureau during the preceding fiscal year.

The total number of pilot-balloon stations in operation by the Weather Bureau at the end of 1935 was 77 (an increase of 1 over the previous year), including 3 stations in Alaska and 1 in Puerto Rico.

During the International month of June, the Weather Bureau released 33 sounding balloons at Omaha, Nebr. Twenty-eight (85 percent) of the meteorographs have been found and returned to date.

Cooperation between the Weather Bureau and the National Bureau of Standards was maintained during the year, in the development of radio-meteorographs for use with sounding balloons, and considerable progress was made.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during year 1935*

TEMPERATURE (° C.)

Stations	Altitude (meters) m. s. l.																Number of observations		
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Billings, Mont. ¹ (1,038 m)	4.1		6.6		4.5		6.8		4.9		1.8		-1.4		-8.1		-14.9		358
Boston, Mass. ² (5 m)	7.1		8.8		4.5		2.3		0.5		-1.7		-3.7		-9.0		-15.0		131
Cheyenne, Wyo. ¹ (1,873 m)	3.5								5.2		5.4		2.6		-4.2		-11.4		358
Fargo, N. Dak. ¹ (274 m)	1.4		3.4		3.8		2.8		1.0		-1.3		-3.8		-9.4		-15.8		362
Kelly Field (San Antonio), Tex. ² (206 m)																			
Lakehurst, N. J. ³ (39 m)	16.1		17.5		16.7		15.1		12.8		10.3		7.5		1.2		-5.5		321
Maxwell Field (Montgomery), Ala. ² (52 m)	8.4		8.8		6.9		5.1		3.1		1.0		-1.2		-6.2		-11.1		279
Mitchel Field (Hempstead, L. I.), N. Y. ² (29 m)	15.0		16.3		14.6		12.3		10.0		7.5		4.8		-1.2		-7.5		328
Murfreesboro, Tenn. ¹ (174 m)	8.0		8.4		6.4		4.5		2.5		0.3		-1.9		-7.3		-13.6		321
Norfolk, Va. ³ (10 m)	11.7		13.0		11.5		9.5		7.4		4.9		2.2		-3.7		-8.9		352
Oklahoma City, Okla. ¹ (391 m)	13.1	-0.8	12.8	-0.4	11.1	-0.2	9.1	0.0	7.0	+0.2	4.9	+0.4	2.8	+0.6	-2.3	+0.7	-8.1	+0.7	291
Omaha, Nebr. ¹ (300 m)	12.2		13.1		13.6		12.2		10.0		7.3		4.2		-2.4		-9.2		352
Pearl Harbor, Territory of Hawaii ³ (6 m)	7.2	-0.1	8.4	0	8.9	-0.7	7.8	-0.7	6.1	-0.5	3.7	-0.3	0.9	-0.2	-5.1	+0.1	-11.5	+0.3	359
Pensacola, Fla. ³ (24 m)	21.5	-3.3	20.4	-0.9	17.1	-0.3	14.2	-0.5	12.5	+0.1	11.1	+0.4	9.0	+0.2	3.9	0.0	-0.9	+0.4	266
San Diego, Calif. ¹ (19 m)	16.5	-1.3	16.6	-0.5	14.8	-0.3	12.7	-0.3	10.4	-0.3	8.2	-0.1	5.8	0.0	0.4	+0.2	-5.4	+0.4	311
Scott Field (Belleville), Ill. ² (135 m)	13.4	-2.9	13.9	-1.2	14.7	-0.9	13.6	-0.6	11.5	-0.9	9.0	-0.8	6.2	-0.9	0.1	-0.6	-6.7	-0.6	357
Seattle, Wash. ³ (25 m)	8.2		10.9		10.0		8.4		6.5		4.3		1.9		-3.7		-9.7		271
Selbridge Field (Mount Clemens), Mich. ² (177 m)	7.8	-3.4	7.8	-1.6	6.6	-0.9	4.3	-0.8	1.8	-0.8	-0.6	-0.7	-2.9	-0.5	-8.4	-0.5	-14.8	-1.0	227
Spokane, Wash. ⁴ (596 m)	6.8		8.3		6.7		5.0		3.2		1.1		-1.3		-6.7		-12.8		308
Sunnyvale, Calif. ³ (10 m)	6.9				5.0		4.3		1.4		-1.6		-1.6		-7.7		-14.4		310
Washington, D. C. ³ (13 m)	12.5	-1.7	11.8	-0.6	13.4	+0.4	12.6	+0.4	10.2	0.0	7.4	-0.1	4.4	+0.1	-1.6	+0.8	-7.2	+1.9	216
Wright Field (Dayton), Ohio ² (244 m)	10.4	-1.3	10.4	-0.4	8.5	-0.6	6.7	-0.4	4.8	-0.3	2.7	-0.2	0.4	-0.4	-4.4	-0.1	-10.0	+0.1	302
	7.1		8.7		7.9		6.1		4.2		2.0		-0.2		-5.4		-11.4		312

RELATIVE HUMIDITY (PERCENT)

Billings, Mont.	64					52		49		51		53		53		51		
Boston, Mass.	73		66		64		62		61		57		53		46		42	
Cheyenne, Wyo.	66								62		53		51		50		51	
Fargo, N. Dak.	82		74		66		62		58		56		54		50		47	
Kelly Field (San Antonio), Tex.	90		79		69		61		56		50		46		41		38	
Lakehurst, N. J.	82		70		68		66		62		58		54		49		45	
Maxwell Field (Montgomery), Ala.	82		67		63		60		55		49		47		42		39	
Mitchel Field (Hempstead, L. I.), N. Y.	83		72		69		67		64		61		58		53		50	
Murfreesboro, Tenn.	84		71		69		67		61		57		54		50		48	
Norfolk, Va.	77	+3	69	+3	65	+3	61	+2	50	+3	56	+3	50	+1	44	+1	40	+1
Oklahoma City, Okla.	80		75		64		58		54		50		48		47		45	
Omaha, Nebr.	83	+3	75	+3	64	+4	58	+3	54	+3	51	+1	51	+2	50	+2	47	+2
Pearl Harbor, Territory of Hawaii.	82	+12	79	+4	81	+1	78	+3	67	0	53	-1	43	+1	33	+2	28	+1
Pensacola, Fla.	83	+2	74	+1	69	+1	63	0	56	-2	51	-3	47	-3	41	-3	38	-2
San Diego, Calif.	85	+12	76	+6	58	+5	48	+5	42	+7	38	+6	36	+6	34	+6	32	+6
Scott Field (Belleville), Ill.	85		65		61		58		54		50		48		46		44	
Seattle, Wash.	84	+8	76	+3	70	+1	66	+1	63	+1	58	+1	54	+2	48	0	48	0
Selbridge Field (Mount Clemens), Mich.	83		71		68		64		58		53		50		46		41	
Spokane, Wash.	70				63		59		57		57		56		53		50	
Sunnyvale, Calif.	82	+9	78	+5	60	+3	50	+4	45	+5	41	+5	39	+5	35	+4	33	+3
Washington, D. C.	78	+6	67	+2	65	+4	63	+4	59	+2	57	+3	53	+3	49	+3	45	+3
Wright Field (Dayton), Ohio	84		74		68		65		58		53		50		46		43	

¹ Weather Bureau.² Army.³ Navy.⁴ Flights made by Washington State National Guard, Jan. 1 to June 30, and by the Weather Bureau, July 1 to Dec. 31, 1935.

Observations taken about 4:00 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.

NOTE.—The departures are based on "normals" covering the following number of years and total number of observations made: Norfolk, 8 years, 1,473 observations; Omaha, 4 years, 1,545 observations; Pearl Harbor, 6 years, 1,213 observations; Pensacola, 8 years, 1,867 observations; San Diego, 7 years, 1,844 observations; Seattle, 6 years, 594 observations; Sunnyvale, 3 years, 665 observations; Washington, 11 years, 2,261 observations.